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China's S&T Intellectuals in the Post-Mao Era:

A Retrospective and Prospective Glimpse

by

Denis Fred Simon

June 14, 1985 1664-85

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Paper prepared for volume edited by Merle Goldman, Chinese Intellectuals and the State: The Search for a New Relationship (Harvard U Press, forthcoming)

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> "The most pressing problem confronting us is the unified arrangement and proper use of scientific and technical personnel."
>
> (Premier Zhao Ziyang, "Speech on the Work of the Government" to the 6th National People's Congress. June 6, 1983.)[1]

The training and effective deployment of high caliber human resources is considered to be essential to the process of economic development. A pool of qualified individuals is needed to staff administrative offices, to provide advice to government officials, to educate the next generation, and to support industrial and agricultural development through efficient management and advances in science and technology. Harbison and Myers, in their seminal study of manpower and education in developing countries, refer to high quality manpower as a strategic resource.[2] They note, however, that most LDCs face severe human resource problems that seriously constrain their prospects for rapid development. These problems include a) a shortage of persons with the critical skills and knowledge required for effective national development, b) inadequate or underdeveloped organizations and institutions for mobilizing human resources, and c) a lack of incentives for persons to engage in particular activities which are vitally important for national development.

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[1] Zhao Ziyang, "Report on the Work of the Government," Beijing Review, July 4, 1983.

[2] F.H. Harbison and C.A. Myers, Education, Manpower and Economic Growth (New York: McGraw Hill, 1964).

More important, the work by Harbison and Myers as well as the writings of Gunnar Myrdal and others suggest that the manpower problem is neither just a problem of quantity or quality; also at issue is the creation of an economic and political climate conducive to the effective utilization of the prevailing manpower base whatever its size or capabilities.[3] Presently, this lesson holds particular significance for China as it attempts to formulate and implement a series of policies designed to improve the use and productivity of the country's present stock of scientists, technicians, and engineers.- After over three decades of debate and controversy surrounding the status and role of intellectuals in general, and S&T personnel in particular, the leadership in Beijing recognizes that without an adequate pool of qualified S&T intellectuals and more strategic placement of these individuals, the country's drive to close the economic and technological gap betwen itself and the West will be largely unsuccessful.

Because of the persistence of a host of political problems, Chinese leaders, to a large extent, have been unable to achieve many of their goals in the use of scientific and technical personnel. The difficulties that characterize the current program to improve the situation of S&T intellectuals are many and far-reaching. While the leadership from Deng Xiaoping on down has made it clear that

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[3]Gunnar Myrdal, Asian Drama: An Inquiry into the Poverty of Nations, Volumes I-III (New York: Pantheon Books, 1968). See also Mark Blaugh, ed., The Economics of Education, Volume 1&2 (Middlesex: Penguin Books, 1969).

"science and technology is a productive force" and that intellectuals "are part of the working class," the status of many intellectuals, including S&T intellectuals, has not improved. Political cadre, many of whom achieved their positions by virtue of the Cultural Revolution and the Gang of Four, continue to obstruct the new policies for ideological reasons as well as for reasons of self-interest. Unless China's leadership at both the national and local level can ensure more effective utilization of S&T intellectuals, the modernization of science and technology will continue to be seriously impeded.

Background

Since the formal announcement of the four modernizations program in early 1978, Chinese leaders have paid increasing attention to the role of science and technology in economic development. This focus on S&T has necessitated a close examination of the prevailing status and utilization of the country's science and technology personnel. Based on a survey of the country's scientists, engineers, and technicians completed in 1981, China's S&T personnel numbered 5.71 million, out of which 338,000 were engaged in full-time scientific research, 2.07 million were engaged in engineering and technical positions, and 1.2 million were employed in teaching.[4] Faced with the stark reality that China's S&T manpower resources had been decimated by political traumas such as the Cultural Revolution, and that the demand for qualified individuals would greatly outstrip the supply

[4] Beijing Review, February 14, 1983, p.16.

over the next several years, a serious effort has been made to repair the damage to higher education and the environment in which scientists and engineers work. Nonetheless, in spite of these efforts, major bottlenecks continue to constrict the implementation of the reforms for S&T personnel as well as the attempt to give added emphasis to science and technology.

In spite of all the rhetoric about the great changes for science and technology, what is striking about the situation of S&T intellectuals in the post-Mao era, is that when the Chinese press cites problems in this area, they bear a remarkable resemblance to those that existed during the 1950s and 1960s. The dilemma of "red versus expert" may be cast in a different form today, but the essence of the current debate reflects many of the same issues that were important in the earlier years of the Communist regime. Much of our knowledge about the status and employment of S&T intellectuals during this earlier period comes from Leo Orleans'book entitled Professional Manpower and Education in Communist China. Written in 1961 in the aftermath of the Great Leap Forward, the book documents a host of "problems" faced by the S&T community: Among the specific difficulties plaguing the S&T community at this time were 1)limited numbers of highly qualified personnnel capable of advanced scientific research, 2)over-emphasis in research on its immediate application, 3)excessive centralization of work assigments, 4)the extensive administrative burdens placed on the scientist, 5)too much interference in research planning, and 6)an inadequate infrastructure for research work, specifically

insufficient and inferior scientific research equipment, poor libraries, etc.

What is even more striking, however, is the apparent persistence of several policy themes that continue to dominate the debate over S&T modernization today. In spite of several politically inspired campaigns, the 1950s and early 1960s as the 1980s was a period in which science and technology were generally held in high esteem and were deemed important to the regime's economic goals.[5] The exception was the Great Leap Forward in the late 1950s. It was also a period in which the leadership was searching for an appropriate formula for the management of scientific and technical personnel. A speech by Premier Zhou Enlai in January 1956 at a Party Central Committee meeting on intellectuals attempted to iron-out the correct policy on scientific and technical workers.[6] In his speech, Zhou admitted the existence of "certain irrational features in our present employment and treatment" of intellectuals, citing such problems as bureaucratism, sectarianism, and departmentalism. In pledging to overcome these problems, he promised improvements in working conditions, better incentives and rewards, and more reference materials

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[5]Richard P. Suttmeier, Research and Revolution: Science Policy and Societal Change in China (Lexington, Mass.: Lexington Books, 1974). In 1956, as part of the effort to promote more rapid industrial progress, an elaborate 12 year science and technology development plan(1956-67) was formulated.

[6]"Party's Experience Shows Key Role of Intellectuals," China Daily, November 24, 1982. See also Suttmeier, Research and Revolution. According to Zhou's own words, the meeting was designed "to find a correct solution for the question of intellectuals, to mobilize them more efficiently, and to make fuller use of their abilities."

and equipment.[7] Yet, in spite of the new atmosphere created by Zhou's remarks, the anti-rightist campaign of 1957-58 quickly changed the prevailing climate. This not only reinforced the political suspicions of many within the S&T community, but it left them once again in a sea of political uncertainty.

Among the important themes, the first and most pervasive was the strong emphasis on the integration of science and production. According to Orleans, "the Party's main aim has been to limit theoretical research and make sure that science concentrates on practical problems which face China in its industrial race."(p.108). Nie Rongzhen, the director of the country's science planning activities in 1958, noted that "experiences in the development of science in our country during the past few years have proved that only by starting from the standpoint of production and socialist construction can the scientific institutions of our country develop."(Red Flag, Number 9, October 1, 1958.)[8] In spite of the concerns regarding the importance of basic research articulated by members of the scientific establishment as early as the mid-1950s, scientists were constantly admonished

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[7]Cheng Chu-yuan, Scientific and Engineering Manpower in Communist China, 1949-1963, #NSF 65-14 (Washington, D.C.: National Science Foundation, 1965, p.257.

[8]For an overview of Nie Rongzhen's views regarding China's intellectuals see Dong Kegong, et.al., "Comrade Nie Rongzhen and Intellectuals," Guangming Ribao, October 4, 1982 translated in JPRS 82237, November 16, 1982, pp.132-139.

to ensure that their research had some practical and immediate applications.[9]

This emphasis on so-called "practical" research had important implications for the position of the Chinese Academy of Sciences, which traditionally had been the country's premier research institution and included China's leading scientific personnel. During the 1950s, the Academy was increasingly viewed as making little practical contribution to the goals of national economic construction. By early 1957, the Academy was replaced in the political hierarchy by a Scientific Planning Committee, an organization that eventually was the precursor to the present-day State Science and Technology Commission.[10] As John Lindbeck notes, the gradual dimunition of the CAS in favor of the SSTC was a product of a debate over the nature of scientific activity. The conclusion had long lasting implications for China's scientific community: the pursuit of new knowledge and understanding for its own sake was to be subordinated to the use of science to

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[9]This theme about the importance of basic research is articulated by Xu Liangying and Fan Dainian in the volume edited by Pierre Perrolle entitled Science and Socialist Construction in China (Beijing: People's Publishing House, 1957). In the book, the authors reflect on the requirements for rapid scientific and technical advance in China. Unfortunately, the "anti-rightist campaign" of 1957 emerged, shelving the hopes of the scientific community.

[10]The "demotion" of the CAS occurred in spite of the efforts to Zhou Enlai, who in 1956 made an important address of the need to improve the treatment of scientists and give science its due place in the country's affairs.

support the planned programs of technological and economic achievement specified by the Party and the State.11

A second theme highlighted by Orleans is the role of foreign technology and training. "Chinese leaders realize that the gap in the level of scientific and technological development between China and the West is so great that it would be folly to pursue advanced research while the chasm exists--that the quickest and most practical way to raise China's level is to borrow and copy from the advanced nations and adapt what is borrowed to the country's own needs..."(p.106) During the 1950s, an important aspect of this policy emphasis was the extensive cooperation in science and technology between Moscow and Beijing. This cooperation provided for the training of Chinese scientific and technical personnel in the USSR as well as the advice and assistance of Soviet technical personnel in China. Estimates are that 11,000 Soviet technicians visited China, while approximately 25,000 Chinese were sent to the USSR for advanced education and technical training. In many of the same ways that the West is influencing China's science and technology establishment today, this interaction shaped China's overall approach to research planning and its management of S&T personnel.12

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11 John Lindbeck, "The Organization and Development of Science," in Sidney Gould, ed., Sciences in Communist China (Washington, D.C.: American Association for the Advancement of Science, 1961), pp.3-58.

12 See L.V. Filatov, An Economic Appraisal of Soviet Scientific and Technical Assistance to China, 1949-1966 (Moscow: Nauka Publishing House, 1980) translated by the Foreign Technology Division, US Air Force, Wright Patterson Air Force Base, Dayton, Ohio.

The third theme identified by Orleans is the emphasis placed on the "love of science" and the popularization of science and technology. At the time, however, the lack of adequate numbers of well-trained S&T manpower to meet the country's needs led to a rather broad definition of "science and technology," thereby allowing anyone with or without the appropriate credentials to engage in what might be minimally called research or innovative activities. The attempt to bring science and technology down to the masses during the period led to the ridicule of many of the better-trained S&T personnel. This did not preclude the continuation of more traditional, high-quality research in both the defense sector and the Chinese Academy of Sciences. Nonetheless, the strategy of "walking on two legs" during the Great Leap Forward created a tension between those who prized the scientific endeavor as the purview of an elite segment of society and those who viewed the mental work associated with science and technology as more mundane and subordinate to manual work.

Just as had occurred in the mid-1950s, the early 1960s witnessed a renaissance of sorts in the treatment of S&T personnel and the role of science and technology in Chinese economic development.[13] Under the tutelage of Marshall Nie Rongzhen, the director of the country's overall S&T activities, and others, moves were made to enhance the treatment of scientists, improve the education system,

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[13]For a discussion of the treatment of intellectuals during the mid-1950s see Roderick MacFarquhar, The Origins of the Cultural Revolution: Contradictions Among the People, 1956-57 (New York: Columbia University Press, 1974).

and devote additional resources to the research sector.[14] An article in Red Flag in late 1962 expressed the view that the only way to promote technological advance was to create a "hard core" of research centers staffed by outstanding scientists.[15] This attempt to spark more rapid S&T advance, which was strengthened for a short time with the announcement in 1964 that China had successfully tested an atomic weapon, however, proved short lived. The onset of the Cultural Revolution in 1965 with its intended attacks on the scientific community proved debilitating to the ranks of the country's scientists, technicians, and engineers.

Among other things, the Cultural Revolution was a manifestation of what Pierre Perrolle has termed "a continuous search for the delicate balance between supporting intellectuals for their contributions to society and dealing with them as obstacles, potential and actual, to social and ideological change."[16] During this period, the dichotomoy of "red" and expert" surfaced to an even greater degree than in the past, with the former taking clear precedence over the latter.[17]

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[14]An important event in this regard was the Guangzhou conference on science and technology planning held in 1962. The conference, which was chaired by Nie Rongzhen, saw the formulation of a second long-term program for S&T development(1963-72)--a program that was eventually disrupted by the Cultural Revolution. See Yan Jici, "Development of the Natural Sciences Over the Past 30 Years," in Ma Feihai, ed., Thirty Years' Review of China's Science and Technology, 1949-79, (Singapore: World Scientific Publishing Company, 1981), pp.1-9.

[15]See Cheng Chu-yuan, Scientific and Engineering Manpower in Communist China, 1949-63 (Washington, D.C.: National Science Foundation, 1965), pp.31-33.

[16]Pierre Perrolle, ed. Science and Socialist Construction in China.

[17]See Rudi Volti, Technology, Politics, and Society in China (Boulder: Westview Press, 1982, pp.59-113.

Referring to the attitudes towards Chinese scientists at the time, Lindbeck noted that "they are bearers of ideas and working habits which China's political leaders, hedged by Marxist dogmatic uncertainties, do not appear to comprehend and trust."[18] Although Merle Goldman has shown that, at least initially, actual efforts were made by leaders such as Zhou Enlai to "exempt" and protect the S&T community from political criticism and censure, these were increasingly unsuccessful as the leadership lost control of the Cultural Revolution.[19]

China's scientists became one of the primary targets of the Red Guards and their political leaders. They were attacked for their elitism, cockiness, ivory tower mentality, and seeming disregard for the practical needs of the masses. As a result, S&T personnel as well as intellectuals in general were labelled "the stinking ninth category," a designation that not only denoted their low status, but also the perception that they had little to contribute to society. With "politics in command," the scientific endeavor that had long been guarded by the S&T community, was completely rebuked.

In spite of the unprecendented attacks that were launched against scientists and the fact that even those working in high-level defense areas were not exempt from attack, the Cultural Revolution was one

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[18] John Lindbeck, "The Organization and Development of Science," in Roderick MacFarquhar, ed., China Under Mao: Politics Takes Command (Cambridge: MIT Press, 1966), p.362.

[19] Merle Goldman, China's Intellectuals: Advise and Dissent (Cambridge: Harvard University Press, 1981), pp.89-155.

of a long-series of attempts in Chinese history to come to grips with the role of intellectuals in society and the political system.[20] This dilemma did not begin with the arrival of the Chinese Communists in 1949, but emerged with the start of China's modern history in the late 19th century. In an article comparing the scientist and the politician, Roger Revelle suggests that each has little empathy for one another. The scientist is driven by his need to explain, predict and control phenomenon through possession of special knowledge. The politician is motivated by power, often claiming to possess greater insight and access to truth than his scientific cohorts.[21]

In communist regimes, in particular, this tension between the two is exacerbated as purveyors of the Party doctrine feel threatened by those who can seemingly offer an alternate or more apolitical view of the world that may threaten the credibility and legitimacy of the ruling elite. Studies of the scientific community in the Soviet Union frequently cite this contradiction as the central problem of that country's S&T system since the days of Stalin.[22] The leadership in a socialist system is thus faced with a basic contradiction between

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[20] Jerome B. Grieder, Intellectuals and the State in Modern China (New York: The Free Press, 1981). Grieder also shows that Chinese intellectuals have also had a difficult times sorting out their own role and place in society.

[21] Roger Revelle, "The Scientist and the Politician," Science, March 21, 1975, pp.1100-1105.

[22] For example, see Robert Miller, "The Scientific-Technical Revolution and the Soviet Administrative Debate," in Paul Cocks, et.al., The Dynamics of Soveit Politics (Cambridge: Harvard University Press, 1976), pp.137-155.

the imperatives of innovation and control.[23] On the one hand it must mobilize the necessary resources to act upon the economic and technological goals it has set for society. As noted earlier, this requires a pool of competent, well trained individuals who possess needed technical skills. On the other hand, the political cadres in positions of authority cannot afford to allow an overly technocratic view of society emerge since such a perspective could make the Party irrelevant or at least raise questions about its capacity to govern.

In the Soviet Union, the incorporation of a technocratic group into the ruling elite in the 1960s and 1970s invited staunch criticism from China, which at the time viewed the emerging Soviet leadership as revisionist, bureaucratic, and irreverant from an ideological point of view.[24] In the Soviet case, this incorporation provided many members of the S&T community with special perquisites and extensive benefits which, in effect, coopted them into the system and rendered them less willing to question the system. Whereas in 1965, Mao's reaction to the increasing technocratic character of the regime was to launch a "cultural revolution" in order to prevent the emergence of a "technocratic leadership," Deng Xiapoing's response in the 1980s has been, in many ways, to move in the Soviet direction and

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[23] See Denis Fred Simon, "Implementation of S&T Reforms in China's Modernization," in David Michael Lampton, ed., Policy Implementation in Post-Mao China (Berkeley: University of California Press, forthcoming).

[24] For a discussion of China's views regarding bureaucratic organization during the Maoist period see Harry Harding, Organizing China: The Problem of Bureaucracy, 1949-76 (Stanford: Stanford University Press, 1981).

in some cases to recast the place of scientific and technical personnel in Chinese society.25

S&T Personnel in the Post-Mao Era

Recognizing that the potential success or failure of the four modernizations program depends, to a large extent, on the contributions of scientific and technical personnel, the post-Mao leadership has attempted to relax the political and economic constraints imposed on the country's S&T intellectuals. Current policies include programs to increase the number of technical persons admitted into the ranks of the Communist Party, expand job mobility, improve salaries and living conditions, provide greater financial incentives for important research achievements, and promote more extenstive ties with the international scientific community. In many respects, if these various programs were to be implemented in their entirety, they would alter in a significant fashion the place of S&T intellectuals in the Chinese political and social order. As the record since 1978 indicates, however, major obstacles remain.

Mobilization of S&T personnel takes place within the broader policy context of economic modernization. In March 1978, just one month after the formal announcement of the four modernizations program, the Chinese leadership held a national science conference in Beijing.

25For some preliminary speculation on this issue see Peter R. Moody, Jr., Chinese Politics After Mao: Development and Liberalization, 1976-1983 (New York: Praeger Publishers, 1983).

The conference, which had been in the planning stage for almost two years, involved extensive consultation with the country's top S&T leaders. It served as a forum to promote the rapid and sustained development of science and technology.[26] A comprehensive plan was mapped out listing 8 priority fields, 27 priority research spheres, and 108 key projects.[27] Even though science and technology had been listed as number three in the overall order of the four modernizations, Deng recognized that without significant progress in S&T, the modernization program could not move ahead.[28]

> "The crux of the four modernizations is the mastery of modern science and technology. Without modern science and technology it is impossible to build modern agriculture, modern industry, or modern national defense. Without high-speed development of science and technology, it is impossible to develop the national economy at high speed."[29]

As with other facets of the modernization drive, the S&T modernization program soon experienced a number of difficulties. As the program for the economy underwent a period of re-thinking and readjustment after the 11th Plenum of the CCP in December 1978, so did the S&T program. Some of the difficulties were related to sheer physical

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[26]For an analysis of the backdrop to the March 1978 meeting see Chung Ko, "The Struggle Around the Outline Report on Science and Technology," Beijing Review, October 28, 1977, pp.5-8. Also see Chung Ko, "Scientific Research Speeds Up," Beijing Review, July 22, 1977, pp.5-12.

[27]Richard P. Suttmeier, Science, Technology and China's Drive for Modernization (Stanford: Hoover Institution Press, 1980).

[28]See Deng Xiaoping's speech at a science and education work conference on August 8, 1977 for the background to the March 1978 meeting. Deng Xiaoping, "Several Opinions Concerning Science and Education Work," translated in FBIS-PRC, July 11, 1983, pp.K1-K9.

[29]Deng Xiaoping, "Speech at the Opening Ceremony of the National Science Conference," Beijing Review, Number 12, March 24, 1978, pp.9-18.

constraints. Suttmeier, in his examination of the available pool of scientists and technicians, notes that the most significant problem was the the shortage of high-quality of scientific manpower.[30] In this context, the leadership soon realized that the damage wrought by the Cultural Revolution in terms of both research and education had been far more extensive than originally thought. At the time many Western visitors to the PRC suggested that China's technological capabilities might range from 10-20 years behind the industrialized world.[31] Other constraints were associated with the quantity and quality of laboratory and testing equipment, availability of library materials, etc.

These physical limitations and technical backwardness, while serious, were overshadowed by more pressing "qualitative" problems associated with the strategic orientation of the S&T modernization program. In essence, there still was too much emphasis on basic research and not enough attention was being given to applied research. Part of the reason that the relations between research and production had not been well-developed was due to the nature of the command economy and the fact that factory managers had few incentives to seek out technical innovations.[32] Under such circumstances, researchers

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[30] Suttmeier, Science, Technology and China's Drive for Modernization, p.6.

[31] Leo Orleans, ed. Science in Contemporary China (Stanford: Stanford University Press, 1981).

[32] For a discussion of these problems by Chinese authors see the special issue entitled China Examines Science Policy, Number 2, Joint Publications Research Service(hereafter JPRS) 83240, April 12, 1983, especially pp.121-206.

lacked the appropriate demand from end-users to guide their research. This problem was further compounded by shortcomings in communication, political attitudes, and the nature of the research environment in China. These problems relate directly to two primary issues: a)the self-perceptions of the scientific community and the relationship between their collective priorities and those of the economic modernization program and b)obstacles to using S&T personnel more effectively, reflecting Deng Xiaoping's belief that "it is not that we do not have talented peoples, the problem is whether we can better organize them and tap their initiative and use their talents to the full extent."[33]

In an analysis of organizational factors affecting scientific creativity in the United States, Nathan Kaplan cites five critical factors that can significantly affect the potential for innovation and research achievement: 1)receptivity or resistance to new ideas; 2)internal and external pressure to produce; 3)freedom to choose problems and change direction; 4)existence of incentives for creativity; and 5)toleration of novel individuals and their associated work styles.[34] Similar points have been made in other studies of R&D management. These studies point out that the optimal research climate must be one in which leadership behavior supports the the norms and values of scientist, especially in terms of professional motivation,

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[33]"Deng Xiaoping Calls for Mobilizing Scientists," Foreign Broadcast Information Service (FBIS), December 1, 1982, p.K1.

[34]Nathan Kaplan, "Some Organizational Factors Affecting Creativity," IRE Transactions on Engineering Management, EM-7, Number 1, 1960, pp.24-30.

self-image, and career ambition.[35] In China, this type of support was just beginning to emerge, though in most cases it was not yet present.

As reports began to reach Beijing concerning all sorts of deviations from stated poliy guidelines and continued obstructionism, it became clear that the so-called "leftist" influence in science and technology had not dissipated with the fall of the Gang of Four and the arrival of Deng Xiaoping and his cohorts. As one commentary in Shanghai's Jiefang Ribao (Liberation Daily) suggested in June 1981, "leftist errors on the science and technology front are mainly expressed as failure to truly regard science and technology as a productive force; the serious consequences of this are that the subjects and projects for scientific research are incompatible with national economic development and thus are out of joint with it."[36] While the policies being articulated at the center may have reflected a desire for change, the reality at the local level was quite different.

> "At present there are still many comrades in the party, including some who are in charge of economic and party and government leadership, who are insufficiently aware of the importance of science and tech nology and who do not sufficiently support scientific and technical work. Many party committees and administrative leadership organs have still failed to put scientific and technical work on their agendas, or

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[35] See assorted articles in Ina Spiegel-Rosing and Derek de Solla Price, eds., Science, Technology and Society: A Cross-Disciplinary Perspective (Beverly Hills: Sage Publications, 1977).

[36] Xia Yulong and Liu Ji, "It Is Also Necessary to Eliminate Erroneous "Leftist" Influence on the Science and Technology Front," Jiefang Ribao, June 2, 1981 translated in FBIS-PRC, China Report, June 11, 1981, pp.K8-12.

> pay lip service to its importance, but actually relegate it to a secondary place, so that it loses out when the pressure of work increases."37

The effort to promote and popularize science and technology led to all sorts of vulgarizations of Beijing's policies. Some members of the scientific community, anxious to re-integrate themselves within the world scientific community, looked to their colleagues overseas for guidance in selecting research topics and priorities. Others, including stalwarts from the Cultural Revolution, wanting to win favor in Beijing, went through the motions of supporting science and technology, but actually did very little to improve research productivity or the utilization of existing S&T personnel. An article in Guangming Ribao in January 1981 spelled out some of the more serious manifestations of these two different approaches. The specific problems were reflected in the tendency among many scientists "of blindly striving to catch up and surpass advanced countries" and not paying attention to science and technology work in enterprises or in agriculture and light industry. They were also associated with deficiencies in the management of science and technology resources, frequently resulting in excessive duplication of projects, irrational research plans, mismatches between research

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37"The Entire Party Should Accord the Proper Importance to Science and Technology," Guangming Ribao, April 18, 1981 translated in JPRS (Joint Publications Research Service) 78147, May 22, 1981, pp.1-5.

tasks and available personnel, and improper use and training of scientific and technically-trained individuals.38

The fact that under the reform experts were still being discriminated against and insufficient importance was attached to science and technology, made it difficult, if not impossible, for the leadership to attribute existing problems to "leftist influence." An editorial in People's Daily in April 1981 suggested that present problems derived from the fact that a)no competition was allowed in the system and therefore no attention was paid to economic results and b)the policy for development of science and technology has never been clear and definite.39 The general tetdency in the aftermath of the Cultural Revolution was to put the S&T system back together the way it was prior to 1965-66. Initially, comprehensive reform of the structure and management of the S&T system was not a prime consideration.

It quickly became apparent, however, to key individuals such as Fang Yi, who was until May 1981 concurrently both the Minister-in-Charge of the State Science and Technology Commission and the President of the Chinese Academy of Sciences, that the centrally orchestrated, plan-oriented, Soviet model of science and technology development

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38"Science and Technology Must Be Developed in Coordination with the National Economy in the Course of Readjustment," Guangming Ribao, January 15, 1981, translated in China Examines Science Policy (Springfield: Foreign Broadcast Information Service, January 1982), pp.3-5.
39"Further Clarify the Policy for the Development of Science and Technology," Renmin Ribao, April 7, 1981 translated in China Examines Science Policy, pp.16-19.

was inappropriate for Chinese needs. Under the Soviet system, there were few incentives for strong links between research and production to materialize.[40] In addition, the vertical structure of the research system promoted compartmentalization rather than cooperation, communication, and coordination. While a highly centralized, task-oriented mode of organization was conducive to accomplishing such major projects as the development of atomic weapons, it was not appropriate for stimulating the type of innovative behavior that leads to new and better quality proucts or more efficient production processes.[41] What was needed was not merely a readjustment of existing priorities and management methods, but a complete overhaul of the system, especially with respect to the role and placement of scientists and technical personnel.

The Reform of Science and Technology

In spite of the expressed determination to move away from a Soviet style system, it was not until late 1982 that the government began

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[40] Jia Weiwen, "Combine the Plans for the Development of Science and Technology with the Plans for Development of the Economy and Society," Renmin Ribao, July 5, 1981, p.3 translated in China Examines Science Policy (Washington, D.C.: Foreign Broadcast Information Service, January 1982). See also R.P. Suttmeier, Science, Technology and China's Drive for Modernization (Stanford: Hoover Institution Press, 1981).

[41] For a description of the development of nuclear weapons in China see "China's Atomic Weapon Story Told," New York Times. May 5, 1985, p.34.

the reform of China's S&T organization and management.[42] In October 1982 Premier Zhao Ziyang used the occasion of the National S&T Awards meeting to point out that China's modernization goals could not be met without improvements in the R&D system.[43] More important, he admonished those who merely paid "lip service" to the call for bringing scientists into fuller play and using S&T to spearhead the modernization drive. His speech was a precursor to the formation of a special leading group for science and technology at the State Council under the supervision of Zhao.[44] In effect, Zhao's decison to take direct charge of the group reflected his desire to put the imprimatur of the premier's office on policies associated with S&T development.

Over the next year or so, a series of policy directives sought a fundamental and far-reaching reform of the science and technology system.[45] They were designed to achieve several objectives. First and foremost, science and technology were to be better coordinated

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[42]It also was in 1982 that a new constitution was adopted. Within the framework of this new constitution, the role of science and technology was acknowledged and the legitimate rights of scientific and technical personnel were spelled out. See Jurgen Domes, Government and Politics in the PRC: A Time of Transition (Boulder: Westview Press, 1985). See also Foreign Languages Press, Politics: China Handbook Series (Beijing, 1985).

[43]See Zhao Ziyang, "A STrategic Question on Invigorating the Economy," Beijing Review, November 15, 1982, pp.13-20. See also "Leaders Attend Science Awards Meeting," Xinhua, October 23, 1982 translated in FBIS-PRC, October 25, 1982, pp.K3-12.

[44]"Zhao Ziyang To Head New Scientific Work Group," FBIS-PRC, January 31, 1983, p.K8.

[45]In many cases, the directives provided the basis for setting up experimental sites to try out the new policies. See Denis Fred Simon, "Rethinking R&D," China Business Review, July-August, 1983, pp.25-31.

with the economy. While basic research was allowed to continue, the primary focus of research was to be applications in industry, agriculture, or national defense. Consequently, some of the projects favored by the scientific community would be postponed or re-structured. The second objective was to promote expanded communication and coordination within the research sector. This was done to avoid excessive duplication, which in some cases had grown quite serious. To achieve this goal, support was given to strengthening the Chinese Scientific and Technological Association(CAST), a semigovernmment umbrella organization for the over 100 professional societies that had re-emerged since the fall of the Gang of Four. CAST helped to promote academic exchanges, disseminate research results, and provide expertise to government organizations at both the national and local level.

A third objective was to promote expanded transfers of technology in four contexts: from research to production, from the coastal areas to the interior, from the military to the civilian sector, and from abroad to China. In order to facilitate better linkages between research to production, the notion of a contract system was gradually introduced. Under such a system, research units could market their technical capabilities and enterprises could seek assistance with production-related problems or tasks. The concept that market forces be used to drive the process of technological innovation

was one that quickly began to receive attention and support.[46]

The placement of persons with scientific and technical expertise in positions of authority became a priority objective.[47] An earlier example was the replacement in May 1981 of Fang Yi, an administrator by training, as head of the Chinese Academy of Sciences with Lu Jiaxi, a Ph.D. chemist educated in the West. The election of Lu Jiaxi was accompanied by the enlargement of the Scientific Council of the CAS, a 400-person body made up of leading scientists and technical personnel that was responsible for overseeing CAS research planning and evaluation of projects.[48] These changes placed the running of the Academy, largely, in the hands of scientists. This change in leadership pleased the scientific community, which long-held that only scientifically qualified persons should direct the affairs of this research organization.[49]

The changes at the CAS were merely a first step in the larger attempt to ensure that scientific and technical personnel were moved into decision-making slots in the local and central governments

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[46]Denis Fred Simon, "Rethinking R&D," China Business Review, July/August 1983, pp.25-31.

[47]For example, in mid-1982, two engineers were named deputy governors of Liaoning province. Beijing Review, May 17, 1982, p.5-6.

[48]In May 1981, there were 283 members added to the Scientific Council through a series of examinations and voting by the original members. According to Fang Yi's comments, this made the council both authoritative and representative. See "Leaders Attend Academy of Sciences Session," Xinhua, translated in China Examines Science Policy, p.146.

[49]Of course, this meant added administrative burdens for many of the scientists, particularly Lu Jiaxi, who during a trip to the US in late 1984 complained about having little time for actual research.

as well as in research institutions and universities.[50] Gradually, the party's direct role in the research sector began to diminish as the government directed that at least 5/6 of each scientist's time was to be spent on research: little, if any, time was left for political study. In early 1982, a "science fund" was created as part of an attempt to introduce the concept of "peer review" into the research planning process. Proposals are judged by panels of qualified scientists using "objective" criteria for evaluating funding requests for proposed projects.[51]

Scientists, engineers, and technical personnel began to fill positions in municipal and provincial-level agencies. In early 1983, for example, the chief engineer of a chemical company was elected vice-mayor of Tianjin.[52] The case stands out not only because of his research successes in the 1950s, but also because he has had strong family connections with relatives in the US, a fact that got him into political trouble during the Cultural Revolution. In areas where persons with a technical background were not assigned

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[50] These moves, while generally welcome by the scientific community, also met with some criticism from among some of the scientists who felt that their new administrative responsibilities imposed excessive time constraints on their ability to conduct research. For example, the newly appointed director of the Institute of Chemical Metallurgy under the CAS complained that he was tied up by endless meetings, in which he spent almost 30 percent of his time. See "Give Our Specialists a Free Hand," China Daily, April 6, 1984.

[51] Suttmeier argues that this fund was introduced to further depoliticize the research environment and to attack such emerging problems as fraud in scientific research. See R.P. Suttmeier, "New Conflicts in the Research Environment," Bulletin of the Atomic Scientists, October 1984, pp.7S-11S.

[52] "Chief Engineer Becomes Tianjin's New Vice-Mayor," China Daily, April 12, 1983.

to formal positions, both individuals and organizations, such as the CAS itself, frequently were requested to provide advice and technical support.

As a result, new impetus was given to the idea of technical consulting. In March 1982, the State Council issued a series of work regulations stating that "units in scientific research, teaching, public health and industrial and agricultural production may temporarily hire intermediate and high-level scientists and technical personnel as advisers or to teach, give leactures and do scientific research and and design work on a part-time basis."[53] These arrangements were institutionalized in January 1983, when a formal consulting organization was established in Beijing in order to provide a mechanism for scientific and technical personnel to offer assistance where needed.[54] According to guidelines provided by Premier Zhao, scientists were to be allowed to offer their service on a part-time basis after they completed their assigned work at their home institution. In return for their services, they were allowed to receive a fee, either on a royalty basis or on a set basis. Once again, organizations as well as individuals were invited to participate. Particular attention was given to the opportunities that such consulting might

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[53]"State Council Issues Scientists Work Regulations," Xinhua, translated in FBIS-PRC, March 25, 1982, pp.K8-9.

[54]"Scientific Consulting Services Expanded," Xinhua, translated in FBIS-PRC, January 20, 1983, pp.K6-7. The first consulting corporation, which operated under the Ministry of Aeronautics Industry, was formed in September 1983. See "First Science and Technology Consultancy Set Up," Xinhua, translated in FBIS-PRC, September 13, 1983, p.K5.

provide for universities anxious to build-up their research capabilities and earn monies for buying needed equipment, etc. Shanghai Jiaotong University, for example, was one of the first to take advanatge opf this situation, earning 1.5 million yuan over the space of a year by providing specialized technical assistance to local and ministerial enterprises as well as government organizations.55

Underlying the official encouragement of consulting was the desire to deal with the irrational distribution and allocation of S&T personnel that had plagued the research system for many years. A majority of the the system's inefficiencies had been due to the overly centralized porcedures for assignments. An administrative streamlining in mid-1981, turned the S&T Cadres Bureau under the State Council over to the Ministry of Labor and Personnel to ensure that future work assignments as well as existing ones would be better managed. It was assumed that the Ministry of Labor and Personnel had a better overview of the country's personnel needs and deficiencies.

One of the more serious problems affecting the S&T personnel structure was the fact that in some areas there was an over-concentration of qualified individuals, while in other areas there were inadequate numbers.56 This problem spanned the range of functional specialization,

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55"University Faculty & Staff Receive Bonus for Consulting Work," China Daily, February 10, 1983, p.3.

56See Leo Orleans, "The Training and Utilization of Scientific and Engineering Manpower in the People's Republic of China," Congressional Research Service, Committee on Science and Technology, US House of Representatives, October 1983.

with some areas such as Beijing having an abundance of engineers and others such as Inner Mongolia having none or only a limited number.[57] It also spanned the various industrial sectors, with a large concentration of skilled personnel in heavy industry but insufficient numbers in agriculture and light industry. According to Guangming Ribao, within the industrial ministries, "almost two-thirds of the engineering and technical personnel are concentrated in the two departments of machine-building and metallurgy and all the engineering and technical personnel in light industries combined is less than fifteen per cent of the total engineering and technical personnel."[58] In addition, these distribution problem also existed in terms of geography, with the large urban centers such as Shanghai and Beijing having more than an adequate supply of S&T personnel and areas within China's interior lacking appreciable numbers of qualified individuals.

Part of reason for the persistence of these distribution problems was the ideology of departmentalism that pervaded China's S&T establishment as it does all facets of the bureaucracy. Once a scientist or engineer went to work for a certain ministry or bureau, he literally "belonged" to that unit, thus limiting any real opportunities for job mobility. Another factor that contributed to the situation

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[57] "Bu He on Shortage of Engineers in Nei Monggol," Xinhua, translated in FBIS-PRC, August 17, 1983, p.R7.

[58] Tao Kai and Ceng Qing, "On the Question of Directional Flow of Scientific and Technical Personnel," Guangming Ribao, July 12, 1982 translated in JPRS 83240, April 12, 1983, p.246.

was the problem of "inbreeding."[59] Many institutions refused to allow their graduates to enter into the work assignmment process, preferring to hoard these people in case of future need. Even though certain types of S&T personnel might have been redundant or underemployed, under the prevailing situation of uncertainty and limited supply, it was better to hold on to someone rather than let someone go who might be needed later.

Two other proposals surfaced during the initial discussions concerning reform of the system for S&T personnel. One dealt with salary and living conditions. When asked about their greatest source of dissatisfaction, 82.4% of the scientists, engineers and technical personnel at the Shanghai Laser Research Institute, one of China's premier research units, pointed to problems related to their standard of living. A higher salary was the number one demand of 34.4%.[60] Because of the previous ambivalence about the contribution of their work and their ambiguous political status, intellectuals had been slated to receive very modest wages. In addition, their housing situations had been seriously disrupted because of the Cultural Revolution. In most cases, even in those instances where intellectuals were recompensated for their losses after the fall of the Gang of Four, the emphasis on science and technology modernization in Beijing

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[59]"Overcoming the Phenomenon of Inbreeding in the Training of Qualified Personnel," Renmin Ribao, September 19, 1983 translated in JPRS 83240, April 12, 1983, pp.243-244.

[60]Gu Jiuguang, "Views of Research Personnel on the Current Reform of Scientific Research," Kexuexue Yu Kexue Jishu Guanli (Scientology and the Management of Science and Technology, #8, 1983 translated in JPRS-CST-84-011, April 17, 1984, pp.155-163.

had not translated into better pay and accommodations for the majority of China's scientists and technical personnel. In certain cases, attempts to improve the living conditions of S&T intellectuals were encoruaged, but in most instances, were not implemented.

The scientists' financial situation did not even improve measurably with the regime's determined move away from the principle of egalitarianism that had been a major part of the Maoist ethos. The so-called "iron-rice bowl" that allowed individuals to collect their salary irrespective of their accomplishments increasingly gave way to a system of financial rewards for scientific personnel who produce more. In the past, however, because of the tendency of all "to eat from the same big pot," awards received by successful inventors or innovators were divided up within the institute, and at times with other local government organizations. The individual primarily responsible for the research achievement received only a modest financial benefit at best.

The other proposal was to place younger individuals in leading positions within S&T organizations.[61] Due to the existing age structure of the scientific community, many of China's best trained scientists are advanced in age. From one perspective, they are still badly

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[61] According to a report in Jingji Ribao, among those S&T personnel with professional titles of high rank. those 61 years or older account for 30.5%, those 56 years or over account for 53%, and those 45 years old or younger account for 2%. See "Problems of the Present State and Existence of China's Science and Technology Contingent," Jingji Ribao, January 4, 1984 translated in JPRS-CST-84-011, April 17, 1984, pp.139-140.

needed to ensure that quality standards are maintained within the research system. From another perspective, however, due to their age they cannot handle the heavy administrative and research burdens that are required by the current drive to promote S&T.[62] And, in some cases, because of China's periodic isolation from the mainstream of world S&T affairs over the last three decades, their ideas about research methodology and research priorities reflect training they received many years ago and is badly out of date. Accordingly, one of the dominant themes of the reforms in S&T has been to provide new opportunities for younger scholars and experts. Confronted, however, by the limited number of young individuals with adequate qualifications amd the traditional tetendecy to promote persons primarily on the basis of seniority, this goal has not been easy to accomplish.[63]

Thus, in spite of the sustained pressure on reluctant party officials and local cadres to pay greater attention to science and technology and the greater authority given to S&T personnel, the reality is that serious implementation problems remain at all levels of society.

Chinese leaders, in their efforts to modernize in a sustained fashion, have linked the reform of the personnel system to the success

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[62] See Orleans, "The Training and Utilization of Scientific and Engineering Manpower in the PRC."

[63] For example, according to a survey conducted in late 1984 by the Talent Resources Survey Committee of Shanghai, an extreme shortage of S&T specialists aged 25-35 may severely hamper the city's development ten years from now. See "Shanghai Faces Talent Shortage," China Daily, November 24, 1984.

of the economic reforms announced by Zhao Ziyang at the 3rd Plenary Session of the 12th Central Committee meeting in October 1984. According to Zhao, "in our drive for socilaist modernization we must respect knowledge and talented people. We must combat all ideas and practices that belittle science and technology, the cultivation of intellectual resources, and the role of intellectuals. We must take resolute action to redress cases of discrimination against intellectuals which still exist in many localities..."[64] As Zhao's speech indicates, ambivalence and mistrust still exists among certain individuals towards intellectuals including scientists and engineers.

In an effort to ameliorate the relations between officials and S&T intellectuals, the S&T Cadres Bureau was removed in 1984 from the Ministry of Labor and Personnel and placed under the direction of the State Science and Technology Commission. This move recognizes that scientists and technical personnel are somewhat unique and therefore cannot be handled as just another component of the labor force. It is represents an explicit attempt to more closely link overall S&T planning with policy-making concerning staffing decisions and the assignment of S&T personnel. At the same time, the Deng leadership introduced additional reforms in the science and technology system.[65] These reforms, announced in a Central Committee document

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64"Decision of the Central Committee of the Communist Party of China on Reform of the Economic Structure," 3rd Plenary Session of the 12th Central Committee, October 20, 1984, p.xiv.

65"Mobility of Scientists Advocated," China Daily, July 19, 1983, p.4.

in early March 1985, give official sanction to implementing and broadening many of the proposals that had been introduced during the previous 2-3 years.66

Yet, even as momentum builds for pushing ahead with more rapid introduction of reforms, the situation for science and technology remains problematic. The effort to bring more S&T intellectuals into the Party continues to meet sharp resistance. The anti-intellectuals of the Mao era continue to hang on. As one Chinese scholar remarked during a discussion in Beijing in early 1985, "the Cultural Revolution has not been negated." Since 1979, a total of 580,000 "professionals, engineers and scientists" were admitted into the Party. Yet, according to the Organizational Department of the CCP, only 17.8% of the 40.95 million members have received an education above the senior middle school level; only 4% have received a tertiary education.67 Over 50% of the membership is basically illiterate.68 And, based on statistics in a December 1984 commenatry in Liaowang, only 22.8% of the country's scientific and technical workers belong to the Party.69 While this latter figure may seem appreciable, it reflects the ambiguity in the definition of what constitutes

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66Zhao Ziyang, "Revamping China's Research System," Beijing Review, April 8, 1985, pp.15-21.
67"A Strategic Task in Building the Party," Renmin Ribao, November 20, 1984 translated in FBIS-PRC, November 23, 1984, p.K6.
68"More Intellectuals Should Be Admitted As Party Members," China Daily, January 16, 1985, p.4.
69"Absorb Large Numbers of Outstanding Intellectuals Into the Party," Liaowang, November 26, 1984 translated in FBIS-PRC, December 19, 1984, pp.K5-6.

an "S&T worker" rather than the strong presence of mainstream scientists and engineers in the CCP.

The apparent continued disrespect for the scientists relates not only to the make-up of the Party but also with its attitude. According to an article by the secretary of the Beijing University party committee, many people still do not recognize the intellectual's role in modernization and even those who do demand higher standards of them than others. Some intellectuals have been considered for party membership for over 10 years, yet when the membership decision is to be made, certain party cadres claim "they do not know for sure" and need to continue observing.70 Similar problems have been encountered by intellectuals in other provinces. In Yunnan, some individuals have applied for membership 3-5 times but are repeatedly told that "further tests are needed; in Liaoning, "they regard intellectuals' desire to voice opinions as disrespect towards leaders and their insistence on the correctness of their views as disobedience."71

70Wang Xuezhen, "We Must Take Further Steps to Solve the Problems Intellectuals Face in Joining the Party," Zhongguo Jiaoyu Bao, December 25, 1984 translated in JPRS-CPS-85-024, March 13, 1985, pp.98-100.

71For Yunnan see "Problem of Intellectuals' Difficulties in Becoming Party Members Can Be Resolved Through Conscientious Work," Yunnan Ribao, July 2, 1984 translated in JPRS-CPS-84-068, October 15, 1984, pp.143-45. For Liaoning see "Conscientiously Solve Intellectuals' Problems in Joining the Party," translated in FBIS-PRC, November 26, 1984, pp.S3-4.

In these cases, the objections to intellectuals are attributed to "the fact that 'leftist' influences have not been totally eliminated." Some "leftist-leaning" cadres view intellectuals as outsiders and feel that "excessive recruitment of new party members from intellectuals will make the party degenerate."[72] Or, according to a report by an engineer at the research institute of the Shanxi Electric Power Center, some party organizations have not even put the recruitment of scientific and technical personnel on their work agenda.[73] An editoral in People's Daily in July 1984 identifies seven examples of obstacles due to leftist influences: failure of local party officials to implement the policy on intellectuals; interpreting someone's hard work and dedication as "attempting to climb the heavens;" being accused of applying for membership under false pretenses; establishing phony criteria in order to find fault, e.g. the candidate's voice was too loud; fear of competition; using position and power to sway other members in the direction of one's own prejudice; and introducing bureaucratic bottlenecks as a delay tactic.[74] In almost each case, the person in question was denied admission; in some cases, they have become so frustrated that they no longer seek admission and in those few cases where they have gained admission, a number

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[72]"Earnestly Solve the Problems Faced by Intellectuals in Joining the CPC," Renmin Ribao, July 4, 1983 translated in FBIS-PRC, July 7, 1983, pp.K11-14.
[73]Zhu He, "Intellectuals Bitterly Disappointed By Inability to Join the Party," Shanxi Ribao, May 7, 1984 translated in JPRS-CPS-84-055, August 15, 1984, pp.102-103.
[74]"Seven Examples of How Difficult It Is For Intellectuals to Join the Party," Renmin Ribao, July 10, 1984, p.5.

are re-considering their membership because it appears to no longer hold the attraction and promise it did in the past.

Nonetheless, an increase in the number of scientists and technical personnel who are Party members is seen as a strategic objective of the current leadership. According to an editorial in People's Daily in November 1984, "recruiting large numbers of Party members from among intellectuals who are qualified for party membership will not impair the party's nature but is precisely an important measure to raise the overall quality of the vanguard of the working class and to build our party into a strong core leading socialist modernization."[75] At the present time, the party is having trouble determining a role for itself and responding to the emphasis being placed on scientific knowledge and technological advance. In July 1983, Hu Qiaomu met with scientists who are party members of the CAS. At that meeting, Hu specified three goals for these individuals: they should play an exemplary and leading role in scientific research work; they should struggle against all erroneous and reactionary tendencies, and give their support to the Party's directives; and they should strive to be models in party activities.[76] As the requirements of modernization increase, the party must have individuals who can play this dual role and serve as models for present and future party members. Unless the CCP can successfully transform

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[75]"Clarify the Muddleheaded Understanding in the Recruitment of Party Members," Renmin Ribao, November 21, 1984 translated in FBIS-PRC, November 21, 1984, pp.K9-11.

[76]"Hu Qiaomu Addresses Party Member Scientists," FBIS-PRC, July 6, 1983, pp.K29-30.

its image and the image of the ideal party member, there will be little incentive for techically-oriented persons to consider membership.

Consistent with and related to this line of thinking is the current attempt to ensure that persons with scientific and technical skills also are placed with leading position in the military. According to a State Council directive, the central government will successively assign unversity graduate graduates to various military units to become "military and political leading cadre."[77] In addition, the National Defense Science, Technology and Industries Commission (NDSTIC), the counterpart to the SSTC, has implemented a series of engineering and technical courses so that the skill levels of defense leaders can be upgraded.[78] Here again, the goal is to develop individuals who possess the technical expertise to serve the country's defense needs while at the same time having the political outlook consistent with the political requirements of the military's party organs--a task not easily accomplished.

Cases where the "leftist" bias towards scientists and technical personnel has been overcome have been given wide publicity in the Chinese press, an indication that up to the present these are unusual rather than the norm. At the Nanjing Forest Chemicals Research Institute, 25 of the last 28 persons admitted into the Party were

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[77]"University Graduates To Go To PLA Units," Xinhua, translated in FBIS-PRC, May 26, 1983, p.K3.

[78]"Defense S&T Cadres Study Technical Subjects on the Job," Guangming Ribao, May 12, 1983 translated in JPRS 84245, September 2, 1983, p.21-22.

scientists and technicians. And, between 1978 and mid-1984, the proportion of scientists and technicians who are party members has risen from 12.5% to 26.3%.[79] In another case, Bei Zhaohan, the party secretary in a Guangzhou pharmaceutical factory, was commended for his role in expanding the use of technically-trained individuals.[80] After becoming party secretary and director of the factory, he immediately brought in a technical person to serve as deputy director. In addition, he brought several technicians to his factory and gave them responsible positions even though they had "bad political labels." In a third case, Wang Hao, a professor of systems engineering and mathematics, was made party secretary at the National Defense Science and Technology University. His appointment was cited because he was able to maintain his research activities while performing well in his new administrative post.[81]

The difficulties that S&T intellectuals have experienced in joining the Party reflect the inconsistent implemention of the Party's overall policy towards intellectuals. In many respects, the uneveness derives from a general lack of commitment on the part of local cadre to the modernization of science and technology.

> "...there are some comrades who neither fully understand the backward state of China's science

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[79] Shi Jinchang, "Party Committee of Nanjing Forest Chemicals Resrach Institute Vigorously Develops Intellectuals Into Party Members," Xinhua Ribao (Nanjing), May 31, 1984 translated in JPRS-CPS-84-056, August 16, 1984, pp.37-38.

[80] "Cadre Protects Intellectuals," China Daily, July 25, 1984, P.4.

[81] Peng Ziqiang, "After the Professor Enters Into Politics," Renmin Ribao, December 7, 1984 translated in JPRS-CPS-85-013, February 11, 1985, pp.50-53.

> and technology, nor do they comprehend the reality that the world's science and technology is developing daily. As a result, they simply have little interest in modern S&T, so they lack a sense of urgency for studying and mastering them, or for reforming China's backwardness. To a certain extent, they are still in a fuzzy-minded state, even to the point of consciously or unconsciously setting up obstacles to the development of science and technology."[82]

At times, this situation has prevented the research environment within several institutes from evolving into the type of creative setting described by Kaplan. On other occasions, an unwillingness to listen to scientists and engineers can lead to waste and other inefficiencies. In a Jiangsu province pharmaceuticals plant, for example, an engineer was elected to manage the facility. The party secretary, however, failed to follow the advice of the new manager regarding the testing of raw alcohol and used the untested alcohol in making several drugs. Consequently, 80,000 bottles of cough medicine had to be discarded, representing a loss of over 30,000 yuan.[83]

In other cases, inaction in implementing the policy towards intellectuals derives from outright prejudice or self-interest. In Xuchang City located in Henan, strong criticisms appeared in the local newspapers and radio broadcasts concerning "the city's malpractices" towards

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[82] Yue Ping, "Combat Ignorance To Advance S&T Development," Guangming Ribao, April 21, 1984 translated in JPRS-CST-84-040, December 6, 1984, pp.41-43.

[83] Sun Jian and Zhu Weiqun, "What Is The Current Situation in Implementing Policies on Intellectuals," Renmin Ribao, July 8, 1984 translated in FBIS-PRC, July 9, 1984, pp.K8-10.

intellectuals.[84] For example, at the Xuchang City Machine Tools Accessories Factory, officials turned a deaf ear to the new policies--even though they acknowledged their existence and legitimacy. In the city's construction commission, an intellectual consistently was ignored because he reported continued instances of bias and discrimination to higher officials. Consequently, many of the city's scientific and technical personnel petitioned to leave the city. Similar problems exist regarding the treatment of S&T personnel who have returned to China after receiving training abroad. Along with facing problems associated with the absence of specialized equipment, many of the returnees encounter such problems as jealousy and bureaucratic red tape--which ultimately affects their ability to make a contribution.[85] According to a mid-1984 survey by the China Science and Technology Association in Tianjin, 24 of the 52 S&T personnel who have returned from abroad noted that they could not carry out any useful experiments under the prevailing administrative structure because they are unable to decide on their own research subjects or choose their own assistants.[86]

In certain cases when intellectuals have experienced mistreatment, government officials have taken action to rectify their problems. In Heilongjiang, the provincial party committee dismissed the party

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[84]Li Jie, et.al., "The Problem Is Already Obvious, the Obstruction Still Awaits Removal," Renmin Ribao, June 8, 1984 translated in JPRS-CPS-84-056, August 16, 1984, pp.59-61.
[85]"Returned Scientists Feeling Stifled," China Daily, August 31, 1984, p.4.
[86]"Boom Years for Studying Abroad,: China Daily, November 26, 1984.

secretary, the president and one vice-president of the Provincial Urban Planning and Design Institute for persecuting intellectuals.[87] According to the charges, four of the institute's main technical workers were discriminated against and evaluated mainly on the basis of whether they were obedient or not. When the situation became known to the provincial CPC, they immediately acted to remove the guilty parties. One way in which local and national authorities have begun to respond to these types of situations has been to send investigation teams to various units to inspect their adherence to the policy on intellectuals. The Ministry of Communications, for example, sent an inspection team to one of their enterprises in Hubei after the party secretary was accused of "bullying" intellectuals.[88] Though different in their basic orientation, these investigation teams are similar to ones that were sent out during the Maoist era to ensure adherence to Mao's political formula for administration and personnel management. [89]

Several instances have been publicized of officials taking away some or all of the rewards given to scientists and engineers for their expertise, an indication of the prevalence of this practice.

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[87]"Cadres Dismissed for Persecuting Intellectuals," Xinhua, November 2, 1984 translated in FBIS-PRC, November 5, 1984, pp.K12-14.
[88]"Ministry To Probe Bullying of Intellectuals," China Daily, March 28, 1984.
[89]Naturally, however, it must be assumed that those engaged in such investigations are not just going through the motions and are fully committed to seeing the policy towards intellectuals carried out. In certain instances, some investigation teams have not been as thorough as they might otherwise have been in making an accurate evaluation of particular situations.

In Guangxi, the renumeration received by an engineer from the Regional Institute of Urban Planning and Design for solving a technical problem for two well-drilling teams was regarded as "the proceeds of corruption" by certain officials.[90] In addition, a salary grade hike that had been awarded to the engineer for a regional, first-class technological innovation several months earlier was held back for thirteen months. In a similar case in Sichuan, a junior engineer used his technical expertise to help the Linyang Ferilizer Factory overcome its operating difficulties.[91] According to the contract signed between the engineer and the factory, he would receive 5% of the profit earned by the factory if he succeeded or would be charged 5% of its losses if the unit continued to lose money. When it turned out that the engineer's work enabled the factory to generate a 240,000 yuan profit, he was to be given a 15,000 yuan award. Some people, however, suggested that 15,000 was too much for one person to get and that it was unfair. Even though the engineer was eventually awarded the funds by the local party committee, the dispute most likely raised some apprehension about engaging in future endeavors.

Moreover, the financial benefit and recognition for scientific and technical achievements usually prove less than initially offered. In one case involving the provincial Academy of Agricultural Science in Zhejiang, each time an award was won, each of the actual recipients

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90"Guanxi Reports on Persecution of Engineer," FBIS-PRC, July 20, 1984, p.P3.
91"Award For Factory Hero Is Disputed," China Daily, September 26, 1984, p.3.

received as little as 10% of the total prize. In most instances, the political and administrative departments took 10%, then the service department took 12%, the library took 3%, the research institute grabbed 15%, and the farm took 10%.[92] In Beijing, a researcher at the Institute of Posts and Telecommunications had his achievement twice rejected because an envious colleague claimed that it was not really an invention and that he was actually a co-inventor. His accuser marshalled support for his claims from the institute party officials, thus delaying recognition to the researcher's accomplishment . Eventually, however, after a thorough evaluation of the product by higher level officials, the researcher finally received his financial award.[93]

The on-going efforts to give greater mobility to S&T personnel have also encountered obstacles. At a national forum on the reform of scientific personnel management in July 1984, five measures to promote job mobility among China's scientists and engineers were formally announced.[94] The main objective of the new program is to combine various aspects of a labor market with the prevailing system of planned assignment. Under this system, outside units

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[92]"Science Awards Cut To Ribbons," China Daily, February 19, 1983, p.3.

[93]"Inventor Wins Award After Three Year Delay," China Daily, August 10, 1983, p.3.

[94]"State Plan To Improve the Flow of Scientists," China Daily, July 23, 1984, p.1. The other features of the plan include creation of a national exchange center for science and technology personnel, establishment of post-doctoral intermediate work assignments, improvements in the work assignments for those who have returned from overseas training, and to give power to local S&T commission to intervene in those situations where S&T personnel are not being used properly.

can make job offers to selected S&T personnel in other units who can then tender their resignations. The purpose of the plan is to promote the flow of technical expertise to needed areas. It is also designed to facilitate technology transfers through movement of personnel.

Various steps have been taken to implement facets of the program to promote greater mobility. A new system of post-doctoral employment has been established and put into trial use at the Institute of Theoretical Physics of the CAS. The rules stipulate that anyone who receives a doctorate from the institute must find a job elsewhere. And, persons with degrees from abroad or other Chinese institutions can seek out a position at the institute by entering into a two year employment contract.[95] At a meeting held by the leading group for science and technology under the State Council, various participants from the industrial ministries agreed to transfer 363 S&T personnel their factories and research units to support 13 major national construction projects.[96] In Guangdong, several engineers at the Huangpu Shipyard were allowed to resign and transfer jobs.[97] Yet, concerns about possible brain drain problems from the interior to

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95"Scientists in Big Jobs Shake-up," China Daily, October 18, 1984.
96"Meeting on Technical Personnel Transfer Ends," Xinhua, March 30, 1984 translated in FBIS-PRC, April 3, 1984, pp.K18-19.
97"Doing Away with "Departmental Ownership of Talents," Renmin Ribao, December 17, 1984 translated in JPRS-CPS-85-021, March 7, 1985, p.60.

the coast and particularly the stubborn adherence to departmentalism prevents large-scale job mobility in the imnmediate future.98

According to a report from the National Talent Exchange Consulting Service Center under the Ministry of Labor and Personnel, it has received more than 1,200 requests for job transfers.99 Out of this number, more than 930 are from persons who are employed in jobs unrelated to their training and more than 240 are from persons who are actually underemployed because their units are over-staffed. These two categories account for 89% of the people registered at the center. At the same time, over 180 units have given requests to the center, identifying over 2,100 vacancies. Yet, in spite this situation, the number of requests that can be filled is extremely small because of bureaucratic conventions. The exchange center must gain the consent of three parties--the unit in need of personnel, the individual concerned, and the original work unit. In addition, the original units frequently request the return of their housing or they require payment from the receiving unit to cover the cost of training or to compenmsate for the loss of qualified personnel. In one case, the fee amounted to 2,000 yuan in advance.

Implications for the Future

98"Flow of Talent Held Up By Personnel System," China Daily, August 17, 1984, p.4.
99"Indigenous Policy Hampers Talent Exchange," Xinhua, December 4, 1984 translated in FBIS-PRC, December 5, 1984, pp.K8-9.

In spite of the concerted and determined efforts underway to improve the status and utilization of scientific and technical personnel, serious obstacles remain. Some of the bottlenecks are inherent in a Communist regime's relationship to the S&T community. The party's claim to legitimate authority rests on the basis on its scientific understanding of the the laws of socialist development. It must be able to mobilize the country's S&T resources to promote national development, but at the same time it must also ensure the political loyalty of the scientific community to give credibility to its "scientific" interpretations.100 The Party seeks control to achieve these ends; scientific and technical personnel seek autonomy. In China, as in the Soviet Union, the effort to incorporate the scientific and technical community into the policymaking apparatus will most likely alter the character of the party-S&T relationship and give new definition the nature of political authority. Yet the extent and pace of the change will continue to be a source of tension for some years to come.

Other bottlenecks reflect the self-interest and prejudices of political cadre who do not want to relinquish their positions to a new elite. And, still others derive from the physical limitations, especially the limited numbers of S&T personnel. While each of these is amendable to some change, the difficulties encountered over the the last several years of reforms suggests that a confluence

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100David Holloway, "Scientific Truth and Political Authority in the Soviet Union," in Leonard Shapiro, ed., Political Opposition in One-Party States (London: MacMillan Press, 1972), pp.152-178.

of forces existing since 1949 will continue to obstruct effective implementation of the policy toward S&T intellectuals.

Nevertheless, the attempt to grant more autonomy to the S&T community and to introduce a variety of institutionalized mechanisms for evaluating research proposals and projects, such as the science fund administered by CAS, may alter the relationship between this community and the state. To a certain degree, it will allow the scientific community to be relatively more "independent." Relatedly, the concurrent decision to bring greater market-type forces to bear on the selection and outcome of research will also foster more autonomy for scientists and for the role of science and research in China. Some will clearly oppose putting financial incentives in the forefront of the scientific endeavor. Others will view the contract system as a means to decrease further dependence on the state. While there may be a split among Chinese scientists attached to the ideal concept of pure science and peer review and the other becoming more comfortable with being judged by the market, the bigger split will continue to be between the scientists and the echelons of the bureaucracy.

The on-going attempt to incorporate more scientific and technical personnel into the leadership ranks at all levels promises to have important implications for the evolving nature of China's political and social system. The possible parallels with the Soviet Union are obvious, but it remains to be seen whether China will look like the Soviet Union in the years ahead. It was suggested early on

that Deng has gone further than the Russians in his policies towards S&T intellectuals. His objective is not simply to coopt this group, but rather, in some respects, to have them "coopt" the Party, like the literati of old. While Chinese leaders do not want a society run by scientists and engineers, they also know that their capacity to achieve the goals set out in the modernization program cannot be attained without the full and sustained support of the country's S&T community and institutions.

In time, party membership may become subordinate to technical qualifications as the key to upward career mobility. Scientists will look less and less to the party as a source of prestige. At the same time, they must be sensitive to the demands of modernization and not be taken by catchy themes such as "the third wave" or "the new global technological revolution." The current environment in which S&T intellectuals have slowly begun to flourish is a fair weather one. Their ability to gain additional freedom and mobility is based on the assumption that the modernization program will proceed ahead, albeit gradually, without any major problems. In some important respects, the scientific community remains vulnerable to being caught up in a future political struggle if the present levels of political balance and cooperation break down. Their present alliance with Deng Xiaoping may be one of convenience rather than desire from the perspective of both sides. And, it goes without saying that the newly acquired perquisites of the scientists and technical personnel could be easily taken away should the political winds shift in an

unfavorable direction. Once again, their future may well depend on their "successes" with respect to meeting the needs of the country's industrial, agricultural, and defense sectors.

Despite the promising reforms, the position of S&T personnel is still ambiguous. There will always be those who do not trust scientists and technicians. And, there are many vested interests that will be upset by efforts to promote intellectuals. In all likelihood, there will be changes at the margins, but it will be some time before China's scientific community can feel comfortable in its newly acquired high-status position. It will therefore be up to Deng and his successors to ease the apprehensions of the scientific community by ensuring that campaigns such as the one against "spiritual pollution" do not threaten the security and access that China's scientists have obtained over the last several years. Since it will be difficult to provide any guarantees in this respect, there will remain an uneasy tension between China's scientists and the system's political cadres.

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